

METHODOLOGY FOR MONTHLY ESTIMATES OF STATE TAX REVENUE

State tax revenues as defined in this report come from taxes imposed upon the citizenry, private and corporate, through laws enacted by the Tennessee General Assembly. Each month, the Department of Revenue collects and apportions tax collections to various funds, as directed by statute, for the operation and financing of state government.

To arrive at monthly distributions for fiscal year tax estimates, which are used to support the state's annual budget as adopted by the General Assembly, the Department of Finance and Administration (F&A) uses the services of the University of Tennessee's Center for Business and Economic Research (CBER) and the Research Section of the Department of Revenue.

CBER uses three separate and distinct methods to allocate the annual revenue estimates across the 12 months of the fiscal year (usually defined as August through July to approximate the collection of revenues on an accrual basis). These methods are discussed below. The Department of Revenue uses a single methodology, much like CBER's Seasonal Factors Model, but which utilizes a much shorter time frame (four years of tax collection data compared to CBER's twenty year method.)

For several years, F&A has chosen the four-year approach used by the Revenue department to allocate monthly estimates for all taxes with the exceptions of the sales and use tax and franchise and excise taxes. The four-year method for these particular taxes captures the most recent changes in tax laws which influence the timing and amounts of tax collections and thereby produces a more accurate result as to what is likely to be collected for any given month.

Recognizing that sales tax and franchise and excise tax collections account for about 75 percent of all state tax revenue and that no single model can consistently predict the monthly collections for those taxes with any significant degree of accuracy, the department has chosen to average the three models produced by CBER. This method of blending the estimates produced by the three separate models has the effect of smoothing the monthly highs and lows of any single model and is a more reasonable approach for establishing monthly estimates for these particular taxes.

The end result establishes the benchmark from which actual monthly revenue collections are compared to the official budgeted estimates adopted by the General Assembly and serves as an important budgetary tool in assisting the governor and the commissioner of F&A in keeping the state's budget in a balanced posture throughout the fiscal year.

UNIVERSITY OF TENNESSEE'S CBER MODEL METHODOLOGY

Seasonal Factors Methodology

The tax estimates distributed by seasonal factors were prepared by finding the seasonal patterns, or in other words the seasonal adjustment factors, for fiscal year 2009 actual tax revenues by month. The seasonal adjustment factor for each month is calculated using at least 20 years of historical monthly tax revenue data and the U.S. Census Bureau X12 adjustment model contained in the econometric software EViews 5. (Because EViews cannot seasonally adjust a time series with negative numbers, those months with negative revenues were replaced with \$.000000001, still allowing the seasonal effects to be picked up in the adjustments.) The estimate for each month was found by dividing the official estimate for the fiscal year 2010 by 12 and multiplying by the corresponding month's seasonal adjustment factor from 2009. For example, to find the August 2010 estimate for sales tax revenue, the official 2010 annual estimate for sales tax was divided by 12 and multiplied by the seasonal factor for August 2009.

Constant Growth Methodology

The monthly constant growth tax estimates were prepared by calculating the average annual growth rate from actual revenue in fiscal year 2009 that is necessary to reach the official 2010 estimates for each tax. The fiscal year 2009 monthly revenues for each tax were multiplied by the corresponding required average annual growth rate. For example, to find the August 2010 sales tax revenue, the August 2009 actual revenue was multiplied by the average annual growth rate for sales tax from 2009 to 2010.

Statistical Model

The statistical model is used only for sales and franchise and excise taxes and is based on combined time series and economic models. Specifically for the sales tax, an economic model based on Tennessee personal income data is implemented on the seasonally differenced quarterly revenue data, and the residual is diagnosed as an ARIMA (AR(1 3),MA(2 4)) process. Then an integrated model which incorporates the economic and time series models is used to perform the one-step-ahead estimate and is re-estimated to perform the next one-step-ahead estimate, and so forth. Following that, the quarterly revenue estimate is allocated across each month based on the historical pattern of monthly distribution. For franchise and excise taxes, a time series model is developed on the seasonally differenced monthly revenue data. The ARIMA model chosen for this revenue estimate is based on a diagnosis test of the data characteristics and the criteria that the model produces the least out-of-sample forecast error among all candidate models.